

RAGING RIVER BRIDGE NO. 234A
Spanning the Raging River at Preston-
Fall City Road and Southeast 44th Pl.
Fall City vicinity
King County
Washington

HAER No. WA-141

HAER
WASH
17-FALCI.V,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
Columbia Cascades Support Office
National Park Service
909 First Avenue
Seattle, Washington 98104-1060

HISTORIC AMERICAN ENGINEERING RECORD

HAER
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RAGING RIVER BRIDGE^{No} 234A

HAER No. WA-141

Location:

Preston-Fall City Road and Southeast 44th Place, ^{Fall City vicinity} King County, Washington

UTM Coordinates:

USGS Quad - Fall City
583520E
5268280N

Legal Description:

Township 24N; Range 7E; Section 15

Construction Date:

1937

Engineer:

State of Washington, Department of Highways -- George E. Johnson, Resident Engineer; George H. Shearer, District Engineer

Builder:

H.S. Steffensen, Seattle

Present Owner:

King County Road Services Division
Seattle, Washington

Historic Use:

Vehicular Transportation

Present Use:

Vehicular Transportation;
Bridge To Be Removed in 1998

Significance:

The Raging River Bridge 234A is an example of a half-through steel plate girder bridge. Structures of this type are commonly associated with railroads, and are rare among structures built for highways. The Raging River Bridge has retained its basic design and structure and has not been altered significantly since its construction in 1937.

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Report Date:

October 15, 1997

I. PROJECT DESCRIPTION

Since 1993, the U.S. Department of Transportation, Federal Highway Administration has provided financial assistance to the King County Road Services Division to design for the replacement of the Raging River Bridge 234A, Federal Aid Project No. BRS-172W(001). This bridge, which is located in King County, Washington on the Preston-Fall City Road near Southeast 44th Place and Fall City, is eligible for listing in the National Register of Historic Places. Replacement of the bridge is scheduled for 1998.

The existing structure cannot be relocated, since the poured concrete components, including the bridge deck, piers, and abutments, would break apart during the removal process. To mitigate the adverse effect resulting from the removal of the bridge, the Federal Highway Administration, in consultation with the Washington State Historic Preservation Office, agreed to document the structure according to Historic American Engineering Record (HAER) standards. In late May of 1997, these parties signed a Memorandum of Agreement (MOA) that also included the Washington State Department of Transportation, the King County Road Services Division, and the Advisory Council on Historic Preservation. This MOA stipulated that the HAER documentation of the Raging River Bridge would be completed by late August of 1997.

Herrera Environmental Consultants, a Seattle firm involved in the replacement of the bridge, hired Historical Research Associates, Inc. (HRA) to coordinate with the agencies regarding the MOA. This coordination included obtaining review comments on the draft document, preparing the final document, and securing the signatures of the five agencies. Herrera also requested that HRA prepare the HAER documentation, which is presented in the following report.

II. PHYSICAL DESCRIPTION OF THE RAGING RIVER BRIDGE

The Raging River Bridge 234A is a functional, utilitarian structure located on the Preston-Fall City Road, adjacent to the town of Fall City in King County, Washington. The Preston-Fall City Road is classified as a principal arterial roadway. This bridge carries two lanes of highway traffic in a northeast-southwest direction across the Raging River. It is representative of a bridge type: the half-through steel plate girder. Half of the girder is located above the roadway, with the other half below (see Photographs WA-141-1 and WA-141-2).

The setting is rural, and the components of the bridge that appear below the roadway are often obscured by the lush vegetation along both banks of the river. Located just south of Fall City, the bridge marks the outskirts of the town's development, with a trailer park, store, and gas station appearing immediately north of the Raging River (see Figure 1).

The bridge's largest feature is the half-through steel plate girder on the main span, which measures 97 feet in length, and is deep green in color. It also features four 22-foot reinforced concrete slab approach spans supported on concrete piles, and a 17-foot transition span which connects the main span with the approach spans, making the entire bridge 202 feet long. The bridge's north and south abutments are embedded in the levees that are located on both banks of the river.

Each lane of the bridge measures 12 feet across, giving the roadway a width of 24 feet. The bridge has no shoulders, and features a sidewalk alongside the southwest-bound lane. The sidewalk measures 4 feet, 8 inches in width, and is separated from the southwest-bound lane by the raised half-through steel plate girder on the main span and by a concrete curb on the approach spans.

In addition to its functional, utilitarian components, the bridge offers embellishments that are striking in appearance. Both sides of the structure feature concrete railings comprised of 11 double posts etched with an art deco design. The concrete rail between each set of posts has 13 cut out arches. Two etched lines extend across the length of the railing, bisecting the top of the arch. These railings are painted white, and they run the length of the bridge along the west side. On the east side, the railings extend along the roadway up to the girder. (see Photograph WA-141-4).

The Raging River Bridge 234A is somewhat deteriorated in condition, and the paint is chipped and faded. Even so, it has retained its basic design and structure and has not been altered significantly since its construction in 1937. Bridges of this type -- the half-through steel plate girder -- are commonly associated with railroads, and are rare among structures built for highways.

III. HISTORICAL CONTEXT

Automobiles first appeared in the Pacific Northwest during the late nineteenth century. Few people owned them at that time, however, and roads suitable for cars were scarce. According to one historian, highways "were often nonexistent," forcing motorists "to travel on the open range" and along "railroad rights-of-way."¹ By the early twentieth century, a "transportation revolution" had occurred in the Pacific Northwest, and private cars had replaced the electric streetcar and interurban lines in the major cities of Puget Sound.² This development reflected a nationwide trend. While the number of private automobiles registered in the United States totalled 8,000 in 1900, by 1920 it had increased to 8 million -- and by 1930, the number of cars had risen to 23 million.³

The growth of automobile ownership encouraged the Good Roads Movement, which called for construction of highways throughout the nation. According to the *Pacific Builder and Engineer*, Northwest advocates of Good Roads proved to be especially enthusiastic. They argued that a system of highways would benefit communities in Washington by increasing settlement, commerce, and tourism.⁴ "We are living in a transition period and the changes come rapidly," explained W.J. Roberts, Washington State Highway Commissioner, in 1911. "Evolution in transportation methods affects road construction in no less a degree than the deepening of waterways, and the construction of easier grades and easier curves on the trunk railways." According to Roberts, "A system of state roads is today the li[liest] issue before the people of Washington or any other state."⁵

The Washington State Good Roads conference, which met in Ellensburg in 1916, exemplified this enthusiasm. This event drew more than 1,000 people interested in promoting highway construction. Samuel Hill of Maryhill, Washington, presented color slides of the

¹John A. Jakle, *The Tourist: Travel in Twentieth-Century North America* (Lincoln: University of Nebraska Press, 1985), p. 107.

²Carlos Arnaldo Schwantes, *The Pacific Northwest: An Interpretative History* (Lincoln: University of Nebraska Press, 1996), pp. 369-371.

³John A. Jakle, *The Tourist: Travel in Twentieth-Century North America*, p. 121.

⁴"Good Roads Movement," *Pacific Builder and Engineer* 12 (November 18, 1911), p. 331; A. Warren Gould, "Profit to Be Derived From Good Roads: How Good Roads Should Be the Means of Capitalizing Scenery and Climate," *Pacific Builder and Engineer* 12 (November 18, 1911), pp. 350-351.

⁵W.J. Roberts, "System of Roads: Routes, Mileage and Costs," *Pacific Builder and Engineer*, 12 (November 18, 1911), p. 337.

spectacular natural wonders of the region, including Snoqualmie Pass and Snoqualmie Falls. Although this area had attracted tourists since the late nineteenth century, the prospect of improved roads increased its potential for recreation.⁶

T.R. Agg, author of *American Rural Highways*, observed additional benefits from highway construction. He noted that during World War I, "the inadequacy of the transportation system of the United States became apparent," fueling the demand for better roads that connected communities and major cities. He further noted in 1920 that "motor cars and good roads do a great deal to eliminate the isolation and lack of social opportunity that has characterized rural life in the United States."⁷ Accordingly, during the 1920s the Good Roads Movement continued to advocate creating a transportation network in the Pacific Northwest.⁸

Included in the construction of highways was the building of bridges across the numerous rivers and waterways of western Washington -- a development that proved challenging to highway engineers. Before the proliferation of automobiles, bridge designers focused on railroad traffic, which required heavy weight capacities. Railroad bridges had been constructed of steel, characterized by the heavy riveted steel truss. In contrast, engineers could use a range of bridge types and materials, including concrete, on structures designed for highway traffic. Steel, however, remained the "most suitable material" for long spans over navigable waterways. The design of early structures in Washington derived from the technology of railroad bridges.⁹

One feature frequently used in railroad bridges was the plate girder. In 1911, bridge engineer J.A.L. Waddell described this component as "a beam composed essentially of a wide, thin vertical plate, called the web, along each top and bottom edge of which there is riveted a flange that may consist of various structural shapes." Although associated with railroad bridges, girders also were used -- albeit infrequently -- in highway structures, as was the case with the Raging River Bridge 234A.¹⁰

⁶Yvonne Prater, *Snoqualmie Pass: From Indian Trail to Interstate* (Seattle: The Mountaineers, 1995), p. 55.

⁷T.R. Agg, *American Rural Highways* (New York: McGraw-Hill Book Company, Inc., 1920), pp. 2 and 7.

⁸Gordon B. Dodds, *The American Northwest: A History of Oregon and Washington* (Arlington Heights, Illinois: The Forum Press, Inc., 1986), pp. 223-224.

⁹State Office of Archaeology and Historic Preservation, "Historic Bridges in Washington State," National Register of Historic Places Inventory-Nomination Form, 1979-1980, p. 5.

¹⁰J.A.L. Waddell quoted in Robert H. Krier, "King County Historic Bridge Inventory Phase III: Final Evaluation and Documentation," King County Cultural Resources Division, August 1995, p. 5.

During the 1920s, use of plate girders had increased because they were less expensive to construct and maintain than trusses. Use of girders was further advanced by improvements in rivet driving technology. During the early twentieth century, the introduction of the pneumatic riveter allowed for less expensive filed splices and connections. Generally, hand-riveting crews consisted of four men, including a rivet heater, a buckler-up, a rivet driver, and a worker to catch and enter the rivets. The first of these would grab the hot rivet with rivet-pitching tongs, throwing them to the rivet catcher, who caught it in a bucket or keg. From there, the rivet catcher would place the rivet into a hole, while the buckler-up held a dolly on the head of the rivet. The rivet driver could then begin his work of hammering on the end of the shank and forming the head of the rivet.¹¹

By the 1920s, higher speed cars and increased truck traffic had prompted road and bridge engineers to strengthen highway structures throughout the Pacific Northwest.¹² The Preston and Fall City area followed this pattern, with traffic expanding considerably during the 1920s. Fall City had been platted by Jeremiah Borst in the 1880s, a pioneer associated with mining, hop production, and other activities. By 1929, Fall City's population had reached 250 residents. At that time, the town featured several garages, along with a barber, drug store, and a general store that provided merchandise ranging "from chicken feed to a pair of socks." In addition to its growing population, Fall City attracted tourists. Located 5 miles south of Snoqualmie Falls, the town drew recreational motorists, and offered such amenities as a hotel, ice cream parlor, and two confectionery stores.¹³ Motorists could reach Fall City via the Sunset Highway, an extension of the Snoqualmie and Seattle Wagon Road. This route included numerous bridges, including a structure over the Raging River below the town. A Metsker's Atlas dated 1936 indicates that the Sunset Highway south of the bridge was paved, while the road leading into Fall City immediately north of the bridge was not. By 1940, all segments of the road into Fall City had been paved.¹⁴

¹¹J.A.L. Waddell quoted in Robert H. Krier, "King County Historic Bridge Inventory Phase III: Final Evaluation and Documentation," King County Cultural Resources Division, August 1995, p. 6.

¹²Dwight A. Smith, James B. Norman, and Pieter T. Dykman, *Historic Highway Bridges of Oregon* (Salem: Oregon Department of Transportation, 1985), p. 34.

¹³Clarence B. Bagley, *History of King County Washington*, vol. 1 (Chicago: S.J. Clarke Publishing Company, 1929), p. 806; Yvonne Prater, *Snoqualmie Pass: From Indian Trail to Interstate*, pp. 65-66.

¹⁴General Land Office Map, 1907, Microforms, University of Washington; U.S.G.S. Map, 1919-1921, Map Collection, University of Washington; Metsker's Atlas, 1936, Special Collections, University of Washington; Kroll Map, 1940, Special Collections, University of Washington.

IV. THE CONSTRUCTION AND MAINTENANCE OF THE RAGING RIVER BRIDGE

The Raging River Bridge was first built by a county bridge crew in 1911, during an era associated with the Good Roads Movement in the Pacific Northwest. At that time, the bridge consisted of two 40-foot spans, constructed of wooden planks and piers. In 1920, the King County Engineer's Office replaced this bridge with a second structure that featured a steel span on concrete piers.¹⁵

Increased traffic in the area resulted in a second replacement of the Raging River Bridge in 1937. That year, the State Department of Highways, an agency that preceded the Department of Transportation, built the third structure to stand at this location. L.V. Murrow was the Director of Highways during this period, while George H. Shearer served as District Engineer and George E. Johnson served as Resident Engineer. H.S. Steffensen of Seattle received the contract to fabricate the bridge for \$43,233.95, although the project ultimately cost \$47,142.57 (see Figure 2). For the most part, his crew worked in six-hour shifts for approximately six months.¹⁶ The project included replacement of the existing superstructure with a new steel plate girder and concrete deck, and entailed construction of a temporary detour bridge. The workers were also to replace the existing south approach span with a new concrete approach. The north and south abutments remained in place, although workers widened them at both ends.¹⁷

Steffensen's crew began construction on August 20, 1937, by clearing the bridge and detour structure sites. Workers installed the detour bridge immediately north of the existing structure, and by September 17, it had opened to traffic.¹⁸ During the next six months, the crew used the following equipment in constructing the principal bridge:

- 3/4 cubic yard Northwest shovel
- 3/4 cubic yard Loraine shovel
- Backfill machine with 1/2 cubic yard clam shell
- a variety of dump trucks

¹⁵County Engineer's Records of Bridges and Wharves, King County Archives, Bridge 234A, 1911 and 1920, Road Engineer's Bridge Files, Box 7, Folder 29, n.p.

¹⁶"History," King County Archives, Bridge 234A, 1938, Road Engineer's Bridge Files, Box 22, Folder 14, n.p.

¹⁷Jennyfer S. Jacobson, "Repair Study Report: Raging River Bridge (KC Bridge #234A)," King County Bridge Unit, October, 1992, p. 1.

¹⁸Sheet 1, Primary State Highway No. 2, Raging River Bridge, 1937, King County Archives, Road Engineer's State Highway Project Files, Box 7, Folder 14; "History," King County Archives, Bridge 234 A, 1938, Road Engineer's Bridge Files, Box 22, Folder 14, n.p.

- concrete mixers; 1 Ransome 14 S and 1 Boss 10 S
- Pile driver with Vulcan Steam Hammer
- 10-inch Tremie
- 4, 4-inch Rex centrifugal gas pumps
- 2 Ingersoll Rand compressors, with jackhammer, pavement breaker, and spade
- Winslow platform scales
- Mall vibrator; electric
- Auto truck crane
- 9-inch portable electric hand saw
- Portable compressor; Ford V-8 motor with #80 rivet gun and air jack
- Curtis 60 c.f.m. portable compressor with De Vilbiss spray pot and 2 De Vilbiss spray guns¹⁹

In late September of 1937, Steffenson's crew removed the existing steel span. The Department of Highways hired the Pacific Car and Foundry Company of Renton as a subcontractor to assemble and rivet the plate girders. These were shipped on two flat cars to the Great Northern spur station at Fall City. From this point, workers transported the girders to the site by truck and trailer rig.²⁰

In October and November of 1937, workers removed the existing trestle, including the cap system, stringers, and cap timbers. At that time, the crew also drove the concrete piles for the new bridge. As work proceeded, the crew placed usable stringers from the old trestle to span the falsework bents. A pile driver broke the existing concrete pavement at the north and south approaches by dropping a heavy iron weight attached to the clam shell rig. Workers removed the existing pavement, placing it at the abutments of the bridge as loose riprap.

In the course of this project, the crew encountered unexpected challenges. Workers were surprised, for example, to find that the timber piles below the abutment footings were in "extremely poor condition." They repaired the footing and piles on a force-account basis.²¹

¹⁹"History," King County Archives, Bridge 234 A, 1938, Road Engineer's Bridge Files, Box 22, Folder 14, n.p.

²⁰"History," King County Archives, Bridge 234 A, 1938, Road Engineer's Bridge Files, Box 22, Folder 14, n.p.

²¹Jennyfer S. Jacobson, "Repair Study Report: Raging River Bridge (KC Bridge #234A)," p. 2.

Cement from Seattle arrived by railway and then was trucked to the construction site. Concrete aggregates from the Tibbetts Pit in Issaquah, along with reinforcing steel from Seattle, arrived by truck. Fall City's domestic mains supplied the mixing water. In early December of 1937, the crew poured concrete in the south abutment.²²

Later that month, the crew moved the girders by rollers and a small winch to a position over the piers. Workers then lowered the girders, bolting them to the shoes. Next, they fitted the floor beams and bracing, and bolted them in place. From Renton, a truck carried the sidewalk beams and brackets, bracing, and collision rail to the site. Workers used dollies to move the floor beams and sidewalk brackets along runways on the falsework, where they were placed in position for fitting and bolting by a hand-winch. From December 21 to December 27, workers riveted with a #80 rivet gun and air jack. They grouted the shoes to the piers during this period, using H.E.S. cement. By December 30, they had removed the falsework, and early the next month they began pouring the concrete in the deck. In February, the crew painted the structure, applying a spot coat of red lead and a B-1 coat of brown paint with brushes. The crew applied the final coat of aluminum paint with De Vilbiss spray guns and a portable air compressor.²³

The new bridge opened to traffic on February 11, 1938. Workers then removed the detour bridge with a truck wrecking crane and a Loraine shovel. By February 25, 1938, they had completed the project.²⁴ Photographs from that date indicate that the new bridge featured the half-through steel girder, along with the arched railings and art deco ornamentation -- characteristics that it had retained in 1997.²⁵

Examination of inspection reports further revealed that the bridge has changed very little during the last 60 years. In 1970, King County assumed responsibility for the structure. That year, it appeared generally in "good condition." Three years later, a bridge inspector reported rust along the lower flange of the girder, which had eroded the steel about 1/8th of an inch deep. By 1975, an inspection report had recorded the need for sandblasting and painting the girder. The following year, this task was completed. Additional maintenance included sandblasting and painting the girder again in 1990, and unspecified column and sidewalk repair in 1995.

²²"History," King County Archives, Bridge 234 A, 1938, Road Engineer's Bridge Files, Box 22, Folder 14, n.p.

²³"History," King County Archives, Bridge 234 A, 1938, Road Engineer's Bridge Files, Box 22, Folder 14, n.p.

²⁴"History," King County Archives, Bridge 234 A, 1938, Road Engineer's Bridge Files, Box 22, Folder 14, n.p.

²⁵Photographs 9-11, February 25, 1938, King County Archives, Road Engineer's Bridge Files, Raging River Bridge 234A, Box 22, Folder 14.

Motorists and pedestrians have used the Raging River Bridge for sixty years -- and many locals continue to regard it as a familiar structure associated with the Preston-Fall City Road. As noted, the structure's technological and engineering features remained intact as of 1997. Its rare half-through steel girder serves as a reminder of an early era of engineering, while its art deco embellishments evoke a period that embraced automobile travel with enthusiasm.

V. BIBLIOGRAPHY

Archival Sources

King County Bridge Section
Inspection Reports
Blueprints

King County Archives
Department of Public Works, State Highway Project Files, 66-81, Box 7
Road Engineers Bridge Files, 1908-1950, Boxes 7, 10, 13, and 22

Microforms, University of Washington
General Land Office Map, 1907

Map Collections, University of Washington
U.S.G.S. Map, 1919-1921

Special Collections, University of Washington
Metsker's Atlas, 1936
Kroll Map, 1940

Books, Articles, Pamphlets, and Reports

Agg, T.R.
American Rural Highways. McGraw-Hill Book Company, Inc., New York, 1920.

Bagley, Clarence B.
History of King County Washington. S.J. Clarke Publishing Company, 1929.

Comp, T. Allan and Donald Jackson
Bridge Truss Types: A Guide to Dating and Identifying. National Park Service, HAER Technical Leaflet 95.

Dodds, Gordon B.
The American Northwest: A History of Oregon and Washington. The Forum Press, Inc., Arlington Heights, Illinois, 1986.

"Good Roads Movement."
Pacific Builder and Engineer, 12 (November 18, 1911), pp. 331-332.

Gould, A. Warren

"Profit to Be Derived From Good Roads: How Good Roads Should Be the Means of Capitalizing Scenery and Climate." *Pacific Builder and Engineer*, 12 (November 18, 1911), pp. 350-351.

Hopkins, H.J.

A Span of Bridges. Praeger, New York, 1970.

Jacobsen, Jennyfer S.

"Repair Study Report: Raging River Bridge (KC Bridge #234A)." King County Bridge Unit, Seattle, 1992.

Jakle, John A.

The Tourist: Travel in Twentieth-Century North America. University of Nebraska Press, Lincoln, 1985.

Krier, Robert H.

"King County Historic Bridge Inventory, Phase III: Final Evaluation and Documentation." King County Cultural Resources Division, Seattle, August, 1995.

Prater, Yvonne

Snoqualmie Pass: From Indian Trail to Interstate. The Mountaineers, Seattle, 1995.

Plowden, David

Bridges: The Spans of North America. Viking, New York, 1974.

Roberts, W.J.

"System of Roads: Routes, Mileage and Costs." *Pacific Builder and Engineer*, 12 (November 18, 1911), pp. 137-138.

Schwantes, Carlos Arnaldo

The Pacific Northwest: An Interpretive History, rev. ed. University of Nebraska Press, Lincoln, 1996.

Smith, Dwight, James B. Norman, and Pieter T. Dykman

Historic Highway Bridges of Oregon. Oregon Department of Transportation, Salem, 1985.

State Office of Archaeology and Historic Preservation

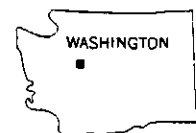
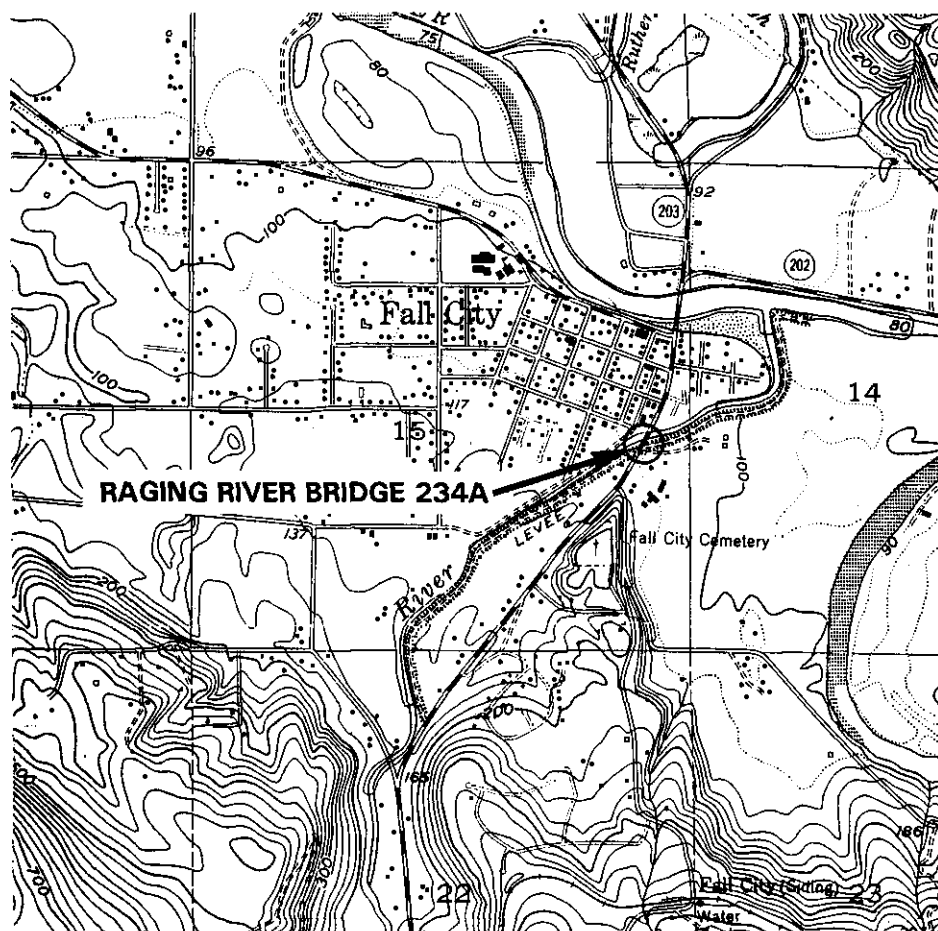
"Historic Bridges in Washington State." National Register of Historic Places Inventory-Nomination Form, 1979-1980.

Tyrrell, Henry Grattan
History of Bridge Engineering. H.G. Tyrrell, Chicago, 1911.

Waddell, J.A.L.
Bridge Engineering. John Wiley & Sons, 1916.

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QUADRANGLE LOCATION

U.S.G.S. 7½' Topo Quad Fall City, Washington 1953 (photorevised 1968 and 1973)
Section 15 Township 24 North Range 7 East County King

Figure 1 Map, Raging River Bridge